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Assistance in mine action

Report of the Secretary-General

Summary

A decade after the international community committed itself to eliminate the scourge of anti-personnel mines, the United Nations can confidently celebrate a number of collective achievements: declining casualties from mines and explosive remnants of war; effective implementation of many key aspects of a strengthened international legal framework; explicit recognition of the importance of gender equality and the rights of persons with disabilities across the mine action sector; and a well-coordinated approach among the many United Nations system partners engaged in mine action on the ground and at Headquarters. The coherent inter-agency approach taken by this sector serves as a model for other cross-cutting issues addressed by the United Nations system.

A salute to the accomplishments of the United Nations must come with renewed commitment. The Organization is well-poised to persist in addressing old threats and to tackle emerging ones. Eliminating the horrendous impact of cluster munitions and effectively addressing the risks posed by explosive remnants of war will bring the United Nations closer to its collective goal of protecting civilians. The continued support of the international community will bolster the ability of mine-affected States to fulfil their commitments under the 1997 Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-personnel Mines and on Their Destruction. The variety of detection and clearance machines available today and widespread use of proven land release strategies will return more contaminated or suspected land to civilian use more quickly. An increasingly sophisticated approach to the integration of mine action requirements into development plans and budgets will help to ensure the sustainability of essential initiatives and the development of national capacities for the future.

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The present report is submitted pursuant to General Assembly resolution 60/97 and provides an update on progress in the implementation of the United Nations inter-agency mine action policy and strategy. The report outlines the achievements of the United Nations Mine Action Team since the previous report of the Secretary-General (A/59/284) and recommends a forward agenda for mine action.

I. Introduction

1. Significant progress has been made in tackling the threat posed by mines and explosive remnants of war as a result of the concerted efforts of Member States, the United Nations, non-governmental organizations (NGOs) and affected communities. Since the 1997 Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-personnel Mines and on Their Destruction, commonly known as the Anti-personnel Mine Ban Treaty, opened for signature 10 years ago, 155 countries have ratified or acceded to it. About 40 million stockpiled anti-personnel mines have been destroyed, and their production, sale and transfer have almost stopped. Over the past three years an unprecedented amount of mined and suspected hazardous area has been deemed mine-free and improved risk reduction tools and methods have contributed to a global decline in casualties. New international instruments on the rights of persons with disabilities give an impetus to our collective victim assistance advocacy and initiatives. The active engagement of all members of affected communities has increased our understanding of the impact of these munitions and has helped to ensure that mine action activities more effectively respond to their needs.

2. As the use of anti-personnel mines has diminished, the nature of the threat has changed. Anti-vehicle mines pose a significant challenge in many parts of Africa, and over 80 countries remain contaminated by explosive remnants of war. Recent conflicts illustrate the grave threat to civilians posed by explosive remnants of war and in some places, such as Nepal, improvised explosive devices have been the major cause of civilian casualties. While I welcome the entry into force of Protocol V on explosive remnants of war of the Convention on Conventional Weapons,[1] there is much to be done to ensure its universalization and implementation. Tragic recent events in Lebanon demonstrated again the horrendous humanitarian impact of cluster munitions both at the time of use and after conflict ends. Although the United Nations leads efforts to ensure that men, women, boys and girls are engaged in and benefit equitably from mine action activities, more must be done to achieve sustainable and tangible results. Diligence is required if the United Nations is to achieve the vision of a world free of the threat of mines and explosive remnants of war, where communities live in a safe environment conducive to development, where the needs of survivors are met, and where survivors are fully integrated into their societies.

3. The United Nations Mine Action Team, consisting of 14 departments, agencies, funds and programmes, has been at the forefront of efforts to ensure United Nations coherence. In June 2005, the United Nations Mine Action Team approved the Mine Action and Effective Coordination: The United Nations Inter-Agency Policy, which replaced the 1998 inter-agency policy. The policy articulates the vision and common positions of UNMAT, the legal framework that guides activities, the coordination mechanisms that maintain system-wide coherence, and the roles and responsibilities of Team actors. Highlighted throughout the present report, is the essential role that coordination plays in ensuring that United Nations support to countries affected by mines and explosive remnants of war is strategic, effective and efficient.

[1] Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects.

4. Since the previous report of the Secretary-General on assistance in mine action (A/59/284), implementation of the revised United Nations mine action strategy for 2001-2005 (A/58/260/Add.1) was completed. The 6 strategic goals and 48 objectives of that strategy were almost entirely realized. Lessons learned in the implementation of that strategy guided the development of the more results-oriented United Nations Inter-Agency Mine Action Strategy: 2006-2010. An update on the implementation of the strategy for 2006-2010 is provided in this report.

5. The present report is submitted pursuant to General Assembly resolution 60/97. In the resolution the General Assembly declared 4 April as International Day for Mine Awareness and Assistance in Mine Action. Observance of that day in 2006 and 2007 brought global attention to the plight of victims of mines and explosive remnants of war, and the impact these munitions continue to have on peacebuilding, the return of refugees and internally displaced persons, sustainable development and the effective enjoyment of human rights. News and outreach materials emanated from some 40 countries. In opening the photographic exhibit capturing the impact of these weapons on men, women and children at the United Nations Secretariat on 4 April of this year, the Secretary-General cautioned the international community against wavering in the face of partial success in mine action to date and called for a redoubling of our efforts to realize a safer world.

II. The United Nations mine action agenda

6. The United Nations strategic goal is to work with national authorities and in partnership with NGOs, the private sector, international and regional organizations and others to reduce the humanitarian and socio-economic threats posed by mines and explosive remnants of war, at which point United Nations mine action assistance will no longer be necessary. All United Nations Mine Action Team efforts contribute to the achievement of this goal.

7. The work of the United Nations in mine action continues to be coordinated by the Inter-Agency Coordination Group on Mine Action, which meets as required at the principals' level, and monthly at the working level, chaired by the Under-Secretary-General for Peacekeeping Operations and the Director of the United Nations Mine Action Service, respectively. In 2006, the Inter-Agency Group established an informal sub-group in Geneva to foster effective information-sharing among Geneva-based members and with New York.

A. Strengthening and implementing the legal framework for mine action

8. The normative framework for United Nations mine action comprises the international instruments prohibiting and restricting the use of mines and addressing explosive remnants of war, international humanitarian law and relevant international human rights treaties.[2] The United Nations advocates for universal adherence to this framework and supports Member States to strengthen, monitor and implement relevant international norms. It undertakes this work in collaboration with the

[2] Mine Action and Effective Coordination: The United Nations Inter-Agency Policy, pp. 8-9 (2005).

International Committee of the Red Cross (ICRC), the Geneva International Centre for Humanitarian Demining, and numerous NGOs and mine action organizations.

9. The United Nations continues to support the universalization and implementation of the Anti-personnel Mine Ban Treaty through active participation in meetings of States parties and the intersessional work programme, and assistance to States parties to fulfil their obligations. The success of the Nairobi Summit in late 2004 catalysed efforts to implement the Anti-personnel Mine Ban Treaty, and the Nairobi Action Plan 2005-2009 is guiding United Nations activities until the Second Review Conference in 2009. At that stage, the first 21 mine-affected States parties will face the 10-year clearance deadline imposed by the Treaty.

10. United Nations mine action programmes have supported Afghanistan, Angola, Burundi, Cyprus, the Democratic Republic of the Congo, Ethiopia, Montenegro, Serbia and the Sudan in the destruction of their stockpiles of anti-personnel mines. In December 2006, Angola destroyed its last stockpiles. The Sudan and Burundi are on track to destroy their stockpiles before their Anti-personnel Mine Ban Treaty deadlines in 2008. Within a complex operational environment, Afghanistan has destroyed close to 500,000 stockpiled anti-personnel mines as of July 2007. This process is ongoing but still incomplete owing to limited access to some stockpiled mines.

11. Since 2004 the United Nations has assisted Afghanistan, Burundi, the Democratic Republic of the Congo and the Sudan with their Anti-personnel Mine Ban Treaty reporting and clearance obligations. In 2005, the United Nations Development Programme (UNDP) developed the completion initiative to accelerate progress in countries where a concerted effort and an investment of up to $10 million would assist a State party to the Treaty to meet its clearance deadline. In 2006, Albania finalized its National Mine Action Plan for Completion. The initiative is progressing in Zambia, Malawi, Mauritania and elsewhere.

12. In addition to advocating for the universalization of the Convention on Conventional Weapons Amended Protocol II Prohibitions or Restrictions on the use of Mines, Booby Traps and Other Devices, the United Nations has long supported efforts to strengthen existing international rules applicable to mines other than anti-personnel mines. The presence of anti-vehicle mines can shut down thousands of kilometres of roads and debilitate transportation systems, thereby preventing the safe return of displaced persons, obstructing the delivery of humanitarian aid and reconstruction activities, and substantially increasing the costs of United Nations operations. It was disappointing that the discussions on a new protocol on anti-vehicle mines within the Convention On Conventional Weapons context did not produce results in 2006, and the Secretary-General encourages States parties to pursue the strengthening of existing law in this area.

13. Effective implementation of Protocol V on explosive remnants of war by all parties to armed conflicts will improve the protection of civilians and peacekeeping and humanitarian personnel, and decrease the impact of explosive remnants of war on freedom of movement and on access to land and livelihoods. Protocol V entered into force on 12 November 2006 and so far only 32 States have expressed their consent to be bound by it. This November marks the First Conference of High Contracting Parties, at which many key decisions will be made on the operationalization of Protocol V. The Secretary-General urges all Member States to ratify or accede to Protocol V as a matter of urgency.

14. The international community has grown increasingly committed to eliminating the horrendous humanitarian impact of cluster munitions. The United Nations Mine Action Team has intensified its awareness-raising about the unacceptable harm caused by cluster munitions and provided technical input into relevant deliberations of Member States. In 2005, the Inter-Agency Coordination Group On Mine Action established the Cluster Munitions Working Group to develop common positions across the United Nations system on these weapons. That year, it commissioned the United Nations Institute for Disarmament Research to publish studies on the impact of cluster munitions in Albania and the Lao People's Democratic Republic.

15. In March 2005, the United Nations Mine Action Service, UNDP and the United Nations Children's Fund (UNICEF) submitted proposed definitions of "cluster munitions" and "sub-munitions" to the Group of Governmental Experts of the Convention on Conventional Weapons, which have been used by Member States in the development of national legislation.[3] The United Nations contributed information to national legislation efforts in France and Australia. UNICEF supported the Cluster Munitions Coalition and Handicap International in their advocacy efforts. The United Nations Mine Action Service, UNDP and UNICEF, with assistance from the Geneva International Centre for Humanitarian Demining, conducted a survey in 2005 and concluded that among all the munitions found by clearance personnel, cluster munitions pose the highest level of threat to the safety of local populations and clearance operators.

16. Tragically, the current impetus for urgent action on cluster munitions was the widespread contamination of land, destruction of infrastructure, and loss of life and limb from these weapons in Lebanon in 2006. Lebanon was littered with hundreds of thousands of sub-munitions that failed to explode, drawing global attention to the humanitarian and human rights impact of these indiscriminate weapons. Reports to the Human Rights Council in September and October 2006 concluded that cluster munitions were used in violation of international humanitarian law and denied the enjoyment of civil, cultural, economic, political and social rights both during and after conflict.[4] At the Third Review Conference of States Parties to the Convention on Conventional Weapons in November 2006, the Secretary-General called for effective norms to address cluster munitions. The Convention on Conventional Weapons agreed to discuss the matter, and the Meeting of the States Parties to the Convention on Conventional Weapons in November 2007 will have before it a recommendation to decide how best to address the humanitarian impact of cluster munitions as a matter of urgency, including the possibility of a new instrument.

17. In early 2007 Norway, together with Austria, Ireland, Mexico, New Zealand and Peru, initiated a multilateral process to adopt, by the end of 2008, a legally binding instrument on cluster munitions that cause unacceptable harm to civilians. The Expert Workshop on Cluster Munitions, organized by ICRC in March 2007, brought together technical experts and government representatives to discuss all aspects of the weapons. After conferences in Norway and Peru, 75 States, including many affected and developing countries, are participating in this process. UNDP administered a sponsorship programme enabling 40 delegates from developing

[3] CCW/GGE/X/WG.1/WP.3 (8 March 2005).

[4] For the report on the Commission of Inquiry on Lebanon, see A/HRC/3/2 (23 November 2006). For the reports of the various thematic Special Rapporteurs on the situation in Lebanon, see A/HRC/2/7 (2 October 2006) and A/HRC/2/8 (29 September 2006).

countries to attend the Peru conference. United Nations Mine Action Team has participated in all cluster munitions events, sharing experience from operations in affected countries, and voicing concern about the immediate and long-term impact of these weapons on affected communities and development efforts.

18. The Secretary-General supports all Member States efforts to eliminate the horrendous impact of cluster munitions as soon as possible by reaching an agreement on an effective legally binding instrument. A comprehensive treaty would prohibit possession, production, use and transfer of all cluster munitions that cause unacceptable harm to civilians and include provisions for clearance, risk education, victim assistance and the human rights of survivors, assistance and cooperation, stockpile destruction, and compliance and transparency measures. It would also reaffirm the obligations of users of cluster munitions to distinguish between civilian and military objectives and to prohibit the use of cluster munitions in or near civilian populated areas.

19. This year two new legal instruments of significance for the survivors of mines and explosive remnants of war were opened for signature: the Convention on the Rights of Persons with Disabilities and its Optional Protocol. Strong political support from Member States, the active engagement of civil society and persons with disabilities, including mine and explosive remnants of war survivors, ensured that this was the most rapidly negotiated human rights treaty to date. The United Nations Mine Action Team contributed to the process and is working to encourage ratification and implementation of the Convention.

20. The Convention on the Rights of Persons with Disabilities does not create new rights, but rather outlines how States must ensure the existing civil, cultural, economic, political and social rights of persons with disabilities without discrimination. The Convention on the Rights of Persons with Disabilities shifts the paradigm from a medical or charity perspective that views persons with disabilities as objects of treatment or welfare to a rights-based approach in which persons with disabilities are empowered to be engaged in decisions that affect them and to seek redress for violations of their rights. It provides an elaborate legal and monitoring framework for the achievement of the victim assistance obligations contained in the Anti-personnel Mine Ban Treaty. The new Committee on the Rights of Persons with Disabilities and the national monitoring mechanisms established by the Convention will track the extent to which the rights of survivors of mines and explosive remnants of war are respected. The Secretary-General takes this opportunity to encourage all Member States to ratify the new Convention and its Optional Protocol without delay.

B. Integrating mine action in the United Nations system

21. Mine action is critical to the achievement of the United Nations highest aims: development, security and human rights for all. By drawing on the expertise and capacity of the various entities that make up the United Nations Mine Action Team, mine action considerations have been integrated into many aspects of United Nations work.

22. Mine action activities must benefit men, women, boys and girls equitably, whether in terms of access to cleared land, to mine risk education or to survivor services. Since 2004, the United Nations has been the leader in placing gender

equality on the mine action agenda. The production of the groundbreaking Gender Guidelines for Mine Action Programmes in 2004 catalysed the mine action community, and served as a model for other sectors of United Nations work. The Guidelines were followed by an audit of core mine action documents to ensure that gender considerations are routinely taken into account by staff and annual gender-equality workshops for field programmes. Such initiatives are coordinated by an Inter-Agency Coordination Group on Mine Action Steering Committee on Gender and Mine Action consisting of gender focal points from the United Nations Mine Action Team entities. The United Nations Mine Action Service represents the Steering Committee in United Nations gender mechanisms, including on the implementation of Security Council resolution 1325 (2000) and the Sub-Working Group on Gender and Humanitarian Action of the Inter-Agency Standing Committee.

23. This work is producing results at the country level. Uganda and Mozambique have recently mainstreamed gender considerations in their respective national mine action policies and strategies. In Tajikistan and Azerbaijan, mine action activities take into consideration and reap benefits for men and women. Programmes, such as in Afghanistan, have taken steps to ensure gender balance and a gender-friendly work environment. Targeted training for mine action staff on gender issues takes place in Afghanistan and Sri Lanka. The programme in the Lao People's Democratic Republic initiated a gender analysis of the impact of mines and explosive remnants of war, and in Burundi women played a vital role in the 2006 community survey, comprising 25 per cent of the survey teams and 40 per cent of the interviewees. In Mauritania, five gender-balanced survey teams conducted a landmine impact survey in 2006-2007. The United Nations Mine Action Service annual reports provide age- and sex-disaggregated casualty data and track gender balance across national and international staff.

24. Since 1996 the Security Council has recognized that mine action is vital to restoring international peace and security and to the deployment of United Nations peace operations in affected countries and territories. This recognition has grown and deepened over the years. Since August 2004, 45 of my reports to the Security Council and 12 Security Council resolutions have explicitly referred to mine action. The Mine Action Guidelines for Ceasefire and Peace Agreements were distributed to peacemakers engaged in discussions with parties to conflict in Nepal, and the 8 December 2006 peace agreement contains provisions on the transmission of information on marking, safe storage, clearance and destruction of mines, booby traps and improvised explosive devices. Recent mandates for mine action, such as for the Sudan, acknowledge that mine action efforts support peacekeeping operations as well as humanitarian and development activities. Mine action is fully integrated into the United Nations Assistance Mission in Afghanistan through the country team.

25. Children, particularly boys, continue to represent some 30 per cent of all casualties from mines and explosive remnants of war. In Lebanon and Nepal the percentage is even higher. Pursuant to Security Council resolution 1612 (2000), the Security Council Working Group on Children and Armed Conflict has considered the extent to which mines, explosive remnants of war, and improvised explosive devices are responsible for the maiming and killing of children in Chad, Nepal, Somalia, Sri Lanka and Uganda. This year, the 10-year strategic review of the 1996 Machel Report on the impact of armed conflict on children notes the continuing

impact of mines and explosive remnants of war on children. The report notes the importance of preventive measures, such as warnings to civilians, when these weapons are deployed. Since 2004, Angola, Bosnia and Herzegovina, Colombia and Lebanon have reported that mines and explosive remnants of war are obstacles to the fulfilment of their obligations under the Convention on the Rights of the Child.[5]

26. Mine action facilitates the safe return of refugees and internally displaced persons and their reintegration and recovery. United Nations humanitarian response and funding appeals have effectively integrated mine action at the global and country-specific levels. In the field, mine action is a core element of either the protection or the early recovery cluster depending on the context. At the global level, United Nations Mine Action Service is the mine action focal point in the Protection Cluster led by the United Nations High Commissioner for Refugees (UNHCR) in Geneva. In 2005, 2006 and 2007, mine action projects were integrated into Inter-Agency Consolidated Appeals in Burundi, Chad, Colombia, the Democratic Republic of the Congo, Nepal, the occupied Palestinian territory, the Russian Federation (Chechnya), Somalia, the Sudan, and Uganda.

27. The mine action community recognizes the link between mine action and development. UNDP is working with the United Kingdom, the Government of Canada and the Geneva International Centre for Humanitarian Demining, within the Development Assistance Committee of the Organization for Economic Cooperation and Development on the formulation of guidelines for the integration of mine action into development programming.

C. Planning, responding and evaluating United Nations engagement

28. The United Nations has made great strides in improving our mine action planning and rapid response. Within the Framework for Mine Action Planning and Rapid Response, a threat-monitoring matrix is developed monthly so that the Inter-Agency Coordination Group on Mine Action can determine a response based on the most comprehensive picture of the mine and explosive remnants of war threat available. In the past three years, Mine Action Planning Groups were formed for Guinea-Bissau, southern Lebanon, Pakistan and India (post-earthquake). United Nations Mine Action Service participated in Headquarters-based planning for relevant peace operations, including technical assessment missions to Darfur and Nepal. UNDP supported planning in Algeria, Egypt, the Islamic Republic of Iran, Iraq, Jordan, the Libyan Arab Jamahiriya, Malawi and Zambia and responded rapidly to an ammunitions depot explosion in Mozambique in March 2007. An inter-agency assessment mission to south-central Somalia in June 2007 formulated options to address the significant explosive remnants of war contamination problem.

29. In 2006 the Inter-Agency Coordination Group on Mine Action implemented the rapid response mechanism for the first time since Iraq in 2003. The response in northern Guinea-Bissau, while modest, was pieced together from funding sources in United Nations Mine Action Service, UNDP and the Office for the Coordination of Humanitarian Affairs, illustrating the limitations faced in conflict zones that are

[5] Initial Report of Angola, CRC/C/3/Add.66 (10 August 2004); Initial Report of Bosnia and Herzegovina, CRC/C/11/Add.28 (14 October 2004); Third Periodic Report of Colombia: Addendum, CRC/C/129/Add.6 (24 August 2005); Third Periodic Report of Lebanon, CRC/C/129/Add.7 (25 October 2005).

marginalized from the international community's attention. A review of the response revealed that the development of statements of work and the tendering of contractual services must be done more quickly. That lesson served the system well in August 2006 in southern Lebanon. Mine action staff remained in Tyre throughout the conflict, allowing for an accurate appraisal of the cluster munitions threat, as well as the maintenance of offices that later served as the United Nations humanitarian command centre. The expertise of staff, collaboration within the United Nations system and with external partners, and the generous support of donors produced a swift and comprehensive response, with clearance capacity on the ground within two weeks of the cessation of hostilities.

30. To further develop the United Nations rapid response capacity, in each of the past three years a training exercise has been conducted in Sweden, with the Swedish Rescue Services Agency, a key logistical and operational partner in rapid response. These exercises have included an increasing number of United Nations Mine Action Team members from the field and headquarters, non-governmental and international organizations, and representatives of Member States.

31. Evaluations are equally important to the United Nations Mine Action Team. Over the past three years, evaluations have been completed for United Nations programmes in Albania, Angola, Bosnia and Herzegovina, Russian Federation (Chechnya), Ethiopia, Ethiopia and Eritrea, the Lao People's Democratic Republic, Lebanon, Somalia, Sri Lanka, the Sudan, Uganda and Yemen, many through contracts with external consultants or companies. Lessons learned have served to improve programming in particular countries and informed the development of the United Nations Inter-Agency Mine Action Strategy 2006-2010.

D. Servicing the mine action community

32. United Nations mine action activities depend on the support of donor countries and Member States. The portfolio of mine action projects, compiled by the United Nations Mine Action Service, UNDP and UNICEF, continues to be a unique resource tool for donors, policymakers, and mine action implementers. The portfolio is developed through an inclusive stakeholder process, and thus the product reflects coordinated national strategic plans and the proposed activities of credible implementing partners. Since the previous report of the Secretary-General, the preparation process has been fully automated, with country-based portfolio teams able to provide contemporaneous updates through an online, web-based system.

33. The 2007 Portfolio of Mine Action Projects presented a total budget of $437 million and featured 313 projects from 30 countries or territories and United Nations Headquarters. The unprecedented level of participation from stakeholders signals the maturity of the coordination mechanisms at the field level. A record 116 appealing agencies submitted proposals, compared to 103 in 2006, 91 in 2005 and 83 in 2004. Mine clearance activities consistently receive nearly half of the funds provided to portfolio projects, while targeted support to stockpile destruction, advocacy and victim assistance is on the rise. Mine risk education has generally received less support through the portfolio than through direct funding proposals to donors. Coordination among mine action donors and the United Nations continues to take place within the framework of the Mine Action Support Group, chaired by a

donor country, with secretariat support from the United Nations Mine Action Service on behalf of the United Nations Mine Action Team.

34. Contributions to the United Nations Voluntary Trust Fund for Assistance in Mine Action increased from the amount of $91,763,910, received during the 2004-2005 biennium, to the amount of $119,908,907, received during the 2006-2007 biennium as of 31 July 2007. In 2006 voluntary contributions were provided by a record 22 Governments, the European Commission, the Common Humanitarian Fund for the Sudan and private contributors. In addition, since 1 July 2002, a total of $172,192,241 was appropriated by the General Assembly from assessed contributions to support the mine action mandates of peacekeeping missions in the Sudan, the Democratic Republic of the Congo, Lebanon, Ethiopia and Eritrea, Burundi, and the special political mission in Nepal. This reflects an increase from $6.5 million for the peacekeeping budget year 2002-2003 to $54.6 million for the budget year 2007-2008.

35. Mine action public information activities at the global level are coordinated by the United Nations Mine Action Service through an Inter-Agency Coordination Group on Mine Action Communications Working Group. In the lead-up to the Nairobi Summit on a Mine-Free World in 2004, three public service announcements were developed to draw attention to the impact of mines and Explosive Remnants of War. One of these won four international awards, and the announcements continue to be aired by media worldwide. United Nations Mine Action Team press trips to the Sudan and Tajikistan raised media awareness about the impact of mines and explosive remnants of war on people in these countries. To make mine action information more easily accessible, the United Nations Mine Action Team overhauled the Electronic Mine Information Network. Based on a survey of users, the site was restructured and redesigned with a new platform and other features. Most recently, a United Nations document library was added, allowing users to find United Nations reports and resolutions that refer to mine action. A new section on treaties and law aids users in tracking the development or implementation of relevant international instruments.

36. International Mine Action Standards remain the basis for mine action programming and are kept relevant through an annual review process that was initiated in 2001. The Geneva International Centre for Humanitarian Demining assists the United Nations Mine Action Service to manage the review process, and the Mine Action Information Centre of James Madison University maintains the website where International Mine Action Standards can be found. During the period covered by the present report, new International Mine Action Standards were produced on the management of contracts in mine action and on the use of machines in mine action. Work on nine other new standards is under way and the Advisory Group on Mine Detection Dogs will soon approve a new series on the use of dogs. UNICEF and the Geneva International Centre for Humanitarian Demining published best-practice guidelines to enable implementation of the risk education component of International Mine Action Standards. The term "explosive remnants of war" has been introduced into all relevant International Mine Action Standards.

37. There have been significant developments in the field of mine action technology over the past three years. A much greater concentration on the use of machines has been promoted by a series of technical symposiums held in Croatia, hosted by the Croatian Mine Action Centre. Machines can reduce costs of clearance

and increase outputs in many situations. Since my last report, major advances have been made in the development and deployment of combined sensor detectors designed to reduce the false-alarm rates associated with metal detectors. Dual sensor detectors can increase the speed of manual demining by a factor of five in certain conditions. There is now a greater understanding of the advantages and effectiveness of open tiller arrangements.

III. Progress achieved in the implementation of the United Nations Inter-Agency Mine Action Strategy for 2006-2010

38. The United Nations Inter-Agency Mine Action Strategy 2006-2010 contains a strategic goal, four strategic objectives, a series of key activities related to each objective, and targeted indicators to measure success. A large proportion of activities are being implemented by field programmes that coordinate and operate significant clearance and mine risk education assets. These are United Nations Mine Action Service-managed programmes in Afghanistan, the Democratic Republic of the Congo, Ethiopia and Eritrea, Lebanon, Nepal, the Sudan and Western Sahara, UNDP-supported programmes in 38 countries, and mine risk education and victim assistance programmes supported by UNICEF in over 30 countries. Other members of the United Nations Mine Action Team support mine action activities related to their core functions. UNHCR supports mine action activities in Angola, Burundi, Chad, the Democratic Republic of the Congo, Lebanon, the Sudan and Uganda. The World Food Programme executes mine action as a part of its Road Rehabilitation Programme in southern Sudan. NGOs and commercial demining entities play a significant role in the realization of many of the strategic objectives.

A. Strategic Objective 1: Reduction of death and injury by at least 50 per cent

39. Marking and fencing, mine risk education and mine clearance prevent and reduce death and injury. With better surveillance systems and priority-setting mechanisms, mine risk education is increasingly targeting the most at-risk populations and linking to mine clearance, marking and community development activities. To improve the planning, monitoring and evaluation of risk reduction activities, UNICEF and the Centers for Disease Control and Prevention finalized tools for the collection, storage, analysis and reporting of mine and explosive remnants of war casualties. Globally, the number of countries and territories reporting casualties and the level of casualties has declined substantially since 2003.[6]

40. Recent statistics from Cambodia indicate a significant decline in casualties, from 898 in 2004 to 450 in 2006, corresponding with the use of targeted approaches to risk reduction activities and innovative community-based programmes. In Afghanistan, a total of 180 victims have been reported since January 2007, of which 13 per cent are females and 63 per cent are under the age of 20. These data reveal that an average of 44 Afghans fall victim to mines and explosive remnants of war

[6] *Landmine Monitor Report*, 2004 and 2006.

each month, a 70 per cent decrease from the conservative estimate of 150 casualties per month in 2001. The reduction is attributed to a combination of clearance and mine risk education activities based on targeted survey. In Senegal, owing to intensive mine risk education, only one new mine victim has been recorded so far in 2007, compared with 13 in 2006, 10 in 2005 and 17 in 2004.

41. As a result of clearance and awareness efforts in Albania, no new victims have been registered since 2005 in the northeast. In the Kurdistan region of Iraq, the number of mine and explosive remnants of war victims fell from 201 in 2004, to 102 in 2005, 48 in 2006 and 28 during the first quarter of 2007. In Lebanon, following the 2006 conflict, the number of victims was reduced by over fifteenfold over six months thanks to well-coordinated and well-funded mine risk education and clearance activities. In Ethiopia, reports indicate that mine and explosive remnants of war incidents have decreased by more than 90 per cent since the nationwide landmine impact survey was completed in 2004.

42. There has been an increase in casualties in some countries owing to more conflict, economic insecurity, population movement, as well as better victim data collection mechanisms and analysis of mine and explosive remnants of war accidents reported through media. Although the ongoing survey in the Somaliland region of Somalia indicates a downward trend in mine and explosive remnants of war casualties, the Puntland region of Somalia experienced an increase in casualties from 42 in 2006 to 60 so far in 2007. In Chad, the number of victims rose steadily from 39 in 2005 to 139 in 2006 to 145 in 2007, owing apparently to the recent conflict and the establishment of better data collection mechanisms. As a result of the return of the refugees and internally displaced persons, casualty levels increased in the Sudan by 59 per cent from 2004 to 2006. Guinea-Bissau experienced a significant increase in female casualties, from 7 in 2005 to 21 in 2006, owing to an incident involving anti-vehicle mines in the border region with Senegal where women conduct informal trading activities.

43. The Secretary-General expresses his appreciation to all the brave mine action personnel who work to combat the threat of mines and explosive remnants of war, and extends his deepest sympathy for the scores who lost their lives or have been injured by these weapons or in direct attacks while conducting their tasks over the past three years. The recently updated *Landmine Safety Handbook* and accompanying interactive training course is now widely available to the United Nations family and other humanitarian workers to improve their protection.

B. Strategic Objective 2: Mitigate the risk to community livelihoods and expand freedom of movement for at least 80 per cent of the most seriously affected communities

44. Risk mitigation and expansion of freedom of movement is achieved through surveys, task prioritization for clearance and risk management, land release and impact assessment, and surveillance activities. The goal is to identify and prioritize communities suffering the highest levels of socio-economic impact and restriction of movement from mines and explosive remnants of war, and to target clearance activities to release land and facilities for productive use as quickly as possible. Land is often used for agricultural and community purposes, as well as national-level infrastructure development, such as road reconstruction, electrical networks,

gas lines, and irrigation systems. The United Nations has expanded its support to injury surveillance activities in Cambodia, Iraq, the Lao People's Democratic Republic, Nepal, the Russian Federation (Chechnya), Uganda and Viet Nam to enable better planning and monitoring of risk reduction activities.

45. Since the previous report of the Secretary-General, landmine impact surveys were completed in Afghanistan, Angola, Burundi, Mauritania and Senegal, and ongoing surveys support risk mitigation in Bosnia and Herzegovina, Chad, Guinea-Bissau, Iraq, Jordan, Malawi, Somalia, the Sudan and Yemen. The ongoing survey in Afghanistan estimates that 761 million square metres of land are contaminated, affecting about 4.2 million people or 8 per cent of communities. Between mid-2004 and the end of 2006, 310 square kilometres of contaminated land affecting high-impact communities, returnees, and socio-economic reconstruction projects were cleared. In Angola, survey activities estimated 17 per cent of all residents are living in 1,968 impacted communities, with 600,000 people living in high- and medium-impact areas. Overall, surveys reduced the area suspected to be affected from an ill-defined 30 per cent to a conservative estimate of less than 1 per cent of the national territory. Now 82 communities have been declared free of mines and a total of 6.3 million square metres of suspected land were released through area reduction and clearance. In Burundi, as a result of a community survey completed in May 2006, 86 per cent of the suspected hazardous areas in three southern provinces (Ruyigi, Rutana and Makamba) were declared mine- and explosive remnants of war-free.

46. Land released back to the communities in Mauritania enabled the provision of potable water to 60,000 Nouhadibou residents, the expansion of iron ore extraction facilities in Zourate, and the development of tourist facilities in Nouhadibou. It further increased access to grazing land for nomads in Nouhadibou, Zourate and Bir Mougrien and enabled the extension of city limits in Nouhadibou. In Uganda, demining achievements in 2006 and 2007 include the clearance of 29 suspected hazard areas in the subregions of Lango, Teso, Acholi and Rwenzori. In total, more than 13 square kilometres of land have been made available for use, while another 3 square kilometres were cleared in early 2007 allowing the safe return of refugees and internally displaced persons. In Mozambique, 53,516,569 square metres of land were returned to communities as a result of clearance and survey activities during the period 2004-2006. In Albania, more than 3,250,000 square metres, mostly pasture area, were released to the communities during the reporting period. The entire 42 kilometres section of the Albania-Kosovo border was cleared, allowing for safe border control.

47. In Ethiopia, priority for mine clearance is given to those areas associated with animal herding, wood and water collection, and other agricultural activities. Almost 9 million square metres of land were cleared in 2006, up from six million in 2005, and 8,822,860 square metres of farming and grazing land were returned to productive use. Since September 2006, UNMEE has cleared some 2,200,000 square metres of land and 1,200 kilometres of road in the temporary security zone, enhancing the safe mobility of United Nations personnel, NGOs, and the local population, as well as securing additional land for the safe return of internally displaced persons and refugees. In Cambodia, more than 130 square kilometres of land have been returned to communities for agricultural, community roads, infrastructure, and irrigation purposes between 2004 and June 2007.

48. In southern Lebanon, the Mine Action Coordination Centre continues to find additional cluster strike areas. Between August 2006 and July 2007, 31 per cent of the surface and 17 per cent of the sub-surface of 37.1 million square metres of contaminated area were cleared, and 7 per cent was returned to the communities as a result of action other than clearance. In the post-conflict emergency phase, high-priority locations for clearance were schools, houses and hospitals. Since then, the operational response has focused on the clearance of agricultural lands to secure livelihoods. All known high-impact areas are on target to be cleared by the end of 2007, with a reduced capacity needed throughout 2008 to address remaining priority areas.

49. Yet the United Nations faces challenges in countries of significant size, where mine action operators must overcome considerable security, logistical and sometimes funding obstacles, such as in Afghanistan, the Democratic Republic of the Congo, Iraq, Somalia and the Sudan. In Iraq, the landmine impact survey has been completed in only 13 of the 18 governorates, indicating that at least 2,723,386 persons are at risk and 1,718 square kilometres of land is contaminated. In the Democratic Republic of the Congo, reliable data on contamination are available only for a few surveyed areas (northern Katanga Province, part of southern Katanga and Equateur Provinces, and part of Ituri District). Overall, 3,200,000 square metres were cleared, along with 260 kilometres of roads. In the Sudan, a country-wide landmine impact survey began only in mid-2006, and limited available information indicates that, as of June 2007, 21 of 26 states might be affected by mines or explosive remnants of war. Still over 24 million square metres of cleared land and over 1,768 kilometres of cleared road has improved freedom of movement for internally displaced persons, humanitarian workers, and peacekeepers, and has enabled local farmers to resume business throughout the Sudan. After decades of route closures, roads connecting northern and southern Sudan were declared safe from mines or explosive remnants of war.

C. Strategic Objective 3: Integration of mine action needs into national development and reconstruction plans and budgets in at least 15 countries

50. Mainstreaming mine action into development planning and budgeting ensures that demining priorities reflect the development agenda and the Millennium Development Goals, and opens up financing of mine action activities to the wider development process. It also ensures the sustainability of mine action through the allocation of more national resources and the integration of survivors' long-term needs into the health, education, social welfare and employment sectors. The United Nations assists initiatives that address the needs of victims as part of national programmes for all persons with disabilities.

51. The United Nations assisted 13 countries to integrate mine action into their national development plans and budgets and to mobilize national resources to finance demining activities. Mine action is integrated into the Afghanistan Compact and the Afghan National Development Strategy, and in Uganda's Peace, Recovery and Development Plan and Poverty Eradication Action Plan. In 2005, Mozambique included mine action as a cross-cutting theme in its poverty reduction package, and the Government continued to provide financial contributions to activities. In

Cambodia, mine action is integrated into the National Strategic Development Plan and the common country assessment/United Nations Development Assistance Framework (CCA/UNDAF), and in 2006 the Government invested $800,000 towards that end. The Government of Angola contributed $19,440,000 and 40 Government staff towards mine action operations in 2006. As a part of UNDAF, mine action activities in Albania are fully incorporated in the regional development strategy of the Kukes region. Both Ethiopia and the Sudan have included mine action in the CCA/UNDAF, and mine action is integrated into both northern and southern Sudan budgets. In Senegal, mine action is included in the country programme action plan and is a major component of the Casamance rehabilitation programme.

52. The United Nations supports victim assistance in Afghanistan, Albania, Angola, Cambodia, Colombia, Guinea-Bissau, Iraq, Jordan, Lebanon, the Sudan, Tajikistan, Uganda and Yemen, among other countries. In Uganda, victim assistance indicators to monitor social and economic reintegration of mine survivors and access to their rights are ready for use in the surveillance network database. The Ministry of Health and the Ministry of Gender, Labour and Social Development are actively engaged in addressing victims' needs. Mine survivors are trained and currently producing banana rope in a manufacturing cooperative, established as a public-private partnership between the Kasese Landmine Survivor Group and a high-end manufacturer.

53. In north-eastern Albania, the establishment of a community-based rehabilitation network has increased medical care and rehabilitation, and socio-economic reintegration for survivors. The Yemen Mine Action Centre provides medical assistance, rehabilitation, training and income-generating opportunities to survivors. With the support of UNICEF and other implementing partners, the departments of Bolivar, Sucre, and Antioquia in Colombia provide physical and psycho-social rehabilitation for 265 people with disabilities, including 65 mine victims. In Iraq, the National Mine Action Authority, UNDP, UNICEF and the World Health Organization arranged two workshops on mine risk education and victim assistance matters, and initiated an "injury surveillance" capacity development pilot project to assess victim assistance needs by 2008. UNICEF is supporting the Government of Ethiopia to integrate disability into development planning, and to revise national Government policies and standards.

54. Over the past two years, the United Nations Mine Action Centre in Afghanistan assisted the Ministry of Public Health to draft disability guidelines and develop a victim assistance strategy. The United Nations Human Security Trust Fund project in the Sudan compiles data on the needs of survivors and pilots responsive interventions. After two stakeholder consultative workshops in 2007, bringing together authorities from the north and south, the National Strategic Framework on Victim Assistance: 2007-2011 was approved by the Government, and a network to design, implement and monitor activities has been established.

D. Strategic Objective 4: Assist the development of national institutions to manage the landmine/explosive remnants of war threat, and at the same time prepare for residual capacity in at least 15 countries

55. The United Nations helped many countries to take important steps towards full ownership of their mine action programmes since my last report. The Ethiopia mine action programme will be transferred to full national ownership by the end of 2007. In Yemen, the mine action programme no longer requires the support of a UNDP Chief Technical Adviser. The United Nations Mine Action Service assisted the Government of Burundi to develop its national mine action structure and capacities, handing over responsibilities to the Government, with continued support from UNDP, in August 2006. In Iraq, UNDP supported the development of a national NGO, employing more than 150 Iraqis, to undertake mine action activities in the Basra region. Albania's National Clearance Capacity, begun in 2004, has established six teams of national deminers.

56. National mine action capacities have markedly expanded in many countries. In Senegal, the National Commission for the Implementation of the Anti-personnel Mine Ban Treaty became the national mine action authority, and a national mine action centre was established in August 2006. In Mauritania, the humanitarian demining office was transferred from the military to the Ministry of Economy and Finance in 2007 and now has its own budget for staff salaries, office costs and an operational component. In Angola, since its establishment in 2002, the national mine action authority has significantly developed its capacity in high-level planning, guidance, standard-setting, accreditation of operators and quality assurance. In Afghanistan, a national programme director now leads the United Nations Mine Action Centre in Afghanistan, while a stronger Mine Action Consultative Working Group remains a guiding body. The United Nations Mission in Nepal assisted the formation of a National Mine Action Steering Committee under the chairmanship of the Ministry for Peace and Reconstruction, and the implementation of a training programme to improve the Nepalese Army clearance capacity.

57. Building mine risk education national capacity is also an important component of United Nations work. In Armenia, UNICEF in cooperation with the Ministry of Education and Science ensured teacher training in 60 affected communities. In Burundi, 75 schoolteachers were trained to provide mine risk education as part of school curricula. With UNICEF assistance, local NGOs in Bosnia and Herzegovina developed eight mine risk education plans for highly impacted communities. And 500 teachers from 22 schools in Dushanbe, Tajikistan, have been trained to design and continue mine risk education in their schools. In Afghanistan, mine action-specific units are being established within the Ministry of Education, Ministry of Public Health, and Ministry of Labour, Social Affairs, Martyrs and Disabled.

58. National capacity-building in mine action also takes place at the global level. UNDP facilitates the national mine action staff exchange programme, which in 2006 involved some 30 nationals visiting peer programmes. In partnership with Cranfield University and James Madison University, UNDP also organized two senior and middle management courses for national mine action practitioners in 2006. UNICEF holds annual workshops with its national and international mine action focal points from 33 countries. The Annual International Meeting of Mine Action National

Directors and United Nations Advisers is a dynamic capacity-building forum that brings together national authorities, United Nations staff, donors, and the NGO community. Since the previous report of the Secretary-General, the United Nations Mine Action Team organized three annual meetings in Geneva, hosted by the Geneva International Centre for Humanitarian Demining. The tenth annual meeting, held in March 2007, had the highest attendance to date with 248 participants, including 31 national directors and officials, many of whom also received training on relevant international treaties. The meetings are now the primary venue for reviewing and improving approaches to capacity development, the foundation for national institutions to effectively manage mine action without United Nations assistance.

IV. United Nations mine action agenda: looking forward

59. The measurable progress in the mine action sector over the past 10 years is a great achievement. The coherent, collective and well-resourced efforts of the international community and affected countries have borne fruit, and illustrate again that together we can effectively tackle global challenges. For the United Nations, mine action has also been a success. The coordination architecture at Headquarters and in the field, the inter-agency policy and strategic approach, the development of international guidance standards and the gender mainstreaming practices are all examples of achievements in the mine action sector that have served as models for United Nations system engagement in other cross-cutting, peacebuilding issues.

60. Yet, it is too early to turn attention away from mine action. Member States, the United Nations Mine Action Team, and the mine action community at large must stay committed to the work that remains to be done. The Secretary-General recommends a forward-looking agenda in which:

(a) Member States ratify or accede to the legal framework for mine action: the Anti-personnel Mine Ban Treaty; the Convention on Conventional Weapons Amended Protocol II and Protocol V; and the Convention on the Rights of Persons with Disabilities and its Optional Protocol;

(b) Affected States, donors and mine action practitioners redouble their efforts to promote compliance with the Anti-personnel Mine Ban Treaty as States parties face clearance deadlines in 2009 and 2010;

(c) States parties to Protocol V reach agreement on establishing standards for its effective implementation that best ensure the protection of civilian populations drawing on lessons learned from the implementation of other relevant treaties;

(d) Member States make all efforts to urgently eliminate the horrendous humanitarian, human rights and development impact of cluster munitions by reaching an agreement on a comprehensive and effective legally binding instrument by the end of 2008;

(e) Affected States, donors and the mine action community expand resources and increase programming support for all persons with disabilities, including mine and explosive remnants of war survivors, particularly in the health, social welfare, education and employment sectors, guided by the Convention on the Rights of Persons with Disabilities;

(f) Member States, with the support of mine action practitioners, prevent harm to civilians, particularly children, by providing effective warnings, risk education and other preventive measures when cluster munitions, explosive ordnance, anti-vehicle mines and improvised explosive devices are being deployed;

(g) Member States support the development of United Nations capacity for rapid mine action response to ensure early deployment of risk reduction capacities that will directly contribute to the protection of civilians and humanitarian workers in emergency situations;

(h) Member States continue to recognize the critical role of mine action to peacemaking, peacekeeping and peacebuilding in United Nations resolutions, including the efficient delivery of humanitarian assistance and the safe return of refugees and internally displaced persons, and ensure comprehensive mandates and sufficient resources for United Nations mine action activities;

(i) Affected States, donors and mine action practitioners increase efforts to advance gender mainstreaming and gender balance in mine action programmes, and monitor the extent and effectiveness of efforts to this end;

(j) Affected States, donors, and mine action practitioners develop and implement methodologies for the systematic assessment of the impact of mine action activities on all members of beneficiary communities in order to secure the most equitable and effective operational tasking and use of released land;

(k) Affected States and donors manage the mainstreaming of mine action into development processes vigilantly to ensure that clearance activities address development priorities and avoid mine action programmes being overlooked in donor funding arrangements, resulting in less money for essential activities;

(l) The mine action community at large exploits the advantages of the variety and sophistication of machines available today and enables the increased mechanization of mine and explosive remnants of war clearance;

(m) Member States strongly support the effective coordination of the United Nations Mine Action Team and implementation of the United Nations Inter-Agency Mine Action Strategy 2006-2010;

(n) Mine action donors remain coordinated and committed to the goal of a world free of the impact of mines and explosive remnants of war through the consistent provision of necessary resources, in particular to support the building and development of national capacities in mine action.

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Eradication of poverty and other development issues

Human resources development

Report of the Secretary-General

Summary

The General Assembly, in its resolution 60/211, recognized the increasingly important role that science and technology play in the development of human resources. In particular, it recognized the need for the strategic and innovative use of information and communication technologies in national development policies and programmes to facilitate education, training, knowledge-sharing, recruitment and job creation. The present report responds to the mandate contained in that resolution, which requests the Secretary-General to focus on the role of science and technology in promoting human resources development. The report addresses the challenges and opportunities of using science and technology for human resources development. It explores strategies, especially through the use of information and communication technologies, to promote technology learning and maximize the benefits of technological innovation so as to empower people and expand their economic and social opportunities. The report draws on regional and national experiences and considers the role of the United Nations system in promoting science and technology for human resources development.

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I. Introduction

1. The General Assembly, in its resolution 60/211, recognized the increasingly important role that science and technology play in human resources development in developing countries. It encouraged the strategic and innovative use of information and communication technologies in national development policies and programmes to facilitate education, training, knowledge-sharing, recruitment and job creation. It also requested the Secretary-General to focus on the role of science and technology in promoting human resources development in his report to the Assembly at its sixty-second session.

2. The present report examines the challenges and opportunities that science and technology present in developing human resources. It also explores effective strategies, especially through the use of information and communication technologies that promote technological learning and increase the effective use of technological innovation.

3. Science and technological innovation can overcome important barriers to progress. For example, biotechnology has provided a way forward in agriculture and medicine and offers potential to tackle major health challenges facing the poor. Hydrogen fuel cells and gas-fuelled microturbines have the potential to become economically viable cleaner energy alternatives. Information and communication technologies can facilitate access to basic social services and to knowledge, training, jobs and markets, especially for women and girls and other disadvantaged population groups.

4. Human development is not conceivable without access, assimilation and application of technological knowledge, which empowers people and expands their capabilities and opportunities for social and economic progress. Learning to use and adopt new technologies has become vital to function and progress in the global economy.

5. Globalization, involving greater mobility, connectivity and interdependence of markets, has tremendously accelerated the pace of technological innovation, propelled by international competition and globalized production networks. To participate effectively, a certain minimum threshold of skills and knowledge is required. Minimum entry-level skills are higher then ever before. Specialized education and training have become more important and technology support more essential. The limited resources available to invest in human and physical capital and the absence of proper organizations and institutional arrangements to support science, technology and innovation make it difficult for developing countries to keep up with the rapid technological change. The risks associated with the new technologies and the new global regime of intellectual property rights further complicate the challenge by putting new pressures on the set of skills and organizational practices within enterprises, universities, research and development institutes and manufacturing sites to facilitate technology transfer and innovation.

6. However, science and technology offer important opportunities to bridge the technological divide. The employment of new and emerging technologies, especially information and communication technologies (ICTs), provides new and more cost-effective ways to stretch development resources. ICTs can both enable developing countries to pursue more effective development solutions and to foster knowledge flows and learning. Reaping the benefits of science and technology in developing

countries requires a new approach that places technological learning at the centre of national development strategies.

II. Challenges and opportunities to use science and technology for human resources development

A. Challenges

7. Scientific and technological knowledge cannot be simply transferred and applied. An important lesson learned from the experience of past decades is that imported technology needs to be matched with local engineering capabilities. Upgrading engineering capacity would not only ensure the maintenance of imported machinery, but would also enable capacity-building to adapt and use technology for broader applications. Cost-effective and viable technology transfer involves considerable investments in technical skills and physical infrastructure in a mix of institutional, technological and organizational elements that allow the acquisition, use and diffusion of new technologies. The total cost, at the end, might be very high.

8. Developing countries often lack the basic capacity to absorb and benefit from new technologies. They have limited resources to invest in technical training and build an adequate pool of scientists, technologists and engineers. Such a pool would consent to evaluate, assimilate and apply new technologies to local needs and constraints, and to adapt to rapid changes in knowledge requirements so as to ensure maintenance and sustainability, and to manage risks.

9. Universities, technical institutions, professional associations, research and development institutes and laboratories are among the most critical resources to build indigenous capacity essential for economic and technological transformation. Investment in these institutions is often too low in developing countries. The number of such institutions is generally far below the requirements and their quality is uneven. High-quality institutions are few and the demand far exceeds the supply of coveted posts available.

10. They also tend to be isolated from the local productive sector where technological capabilities accumulate and are commercialized. The divorce between research and development and the relevant stakeholders in the productive sectors is one of the reasons for their low rate of innovation in many developing countries. Research and development capacity tends to be scattered across a wide range of independent research institutions which are not organized under a specific research programme or a specific technology target. Their disconnect from the activities of relevant actors makes the transformation of knowledge and research into commercial ventures very difficult. Technology innovation hubs, such as Bangalore in India or El Ghazala in Tunisia, that bring together research institutes, business and venture capital are useful examples of the benefits of twinning research and business.

11. With the exception of some East Asian countries, most developing countries have given education in science and technology a low priority. Technical and vocational education training is very low in Africa, where tertiary enrolment has included only 6 per cent of the population aged 20 to 24, compared to 23 per cent in other developing countries. Educational curricula of universities and technical institutes are inadequate for technological learning, and graduates are not equipped

to participate in the new and emerging technologies and in innovation. In Africa, the share of enrolments in science and agriculture is approximately the same as in other developing countries, but the share of engineering enrolments is just over half the level in other developing countries. The limited pool of design and engineering skills is further depleted, either by the massive outflow of skilled workers abroad, driven by the lack of job opportunities at home, or by poverty and disease, which lowers the return to technical education.

12. Another important challenge for developing countries is the lack of sufficient and reliable infrastructure. In an era of globalization and knowledge-based economies, the quality and functionality of ICTs as well as logistic infrastructure are essential to operate and diffuse the new technologies. Poor infrastructure constitutes a barrier to both progress and learning, especially for the poorest and most marginalized groups of society.

13. The recent strengthening of the global system of intellectual property rights has changed the rules for acquiring technological innovation. The new intellectual property global regime has raised the value of technology, which has become a key driver of business competitiveness in international trade. The intellectual property rights regime provides greater incentives for developing countries to invest in research and development and foster innovation in the productive sector. However, in many developing countries, the research and development capacity is too limited to take advantage of this opportunity. Most of the research in new technologies is still conducted in developed countries.

14. Strong enforcement of intellectual property rights in developing countries might attract more multinational corporations and foreign firms encouraged by the legal protection of their knowledge and technology. The establishment of the intellectual property rights system itself, however, reduces the opportunities and increases the costs of transferring technology. There is also no evidence that intellectual property rights enforcement facilitates technology flows. Patents limit the use and diffusion of technology imported with foreign direct investment and raises the prices of essential products such as drugs and educational material for university students.

15. Many argue that the intellectual property system inhibits the acquisition, adoption and diffusion of new technologies, because of the costs and limitations imposed on developing countries.

16. The risks associated with new technologies present another challenge for developing countries' technological development. The Internet, for example, has spawned a host of cybercrime. Genetic engineering has given rise to food safety concerns and broader developmental concerns. The increasing use of electronic devices and their rapid turnover have generated environmental concerns for the management and disposal of hazardous waste.

17. These risks are not always easily predictable. They are hidden costs of technologies, especially the costs of environmental and health risks. To be able to gauge the risks of new technologies and identify ways to avoid devastating consequences require capacities that are often not available in developing countries.

B. Opportunities

18. Today's technological advances can accelerate economic and human resources capacities in many areas. Medical breakthroughs lower mortality rates. Higher agricultural production entails better seeds, better water use and more productive fertilizers. ICTs provide low-cost communication and facilitate information flows. Manufacturing technologies drive industrial expansion, employment and incomes.

19. Most technologies, however, are not easily available to developing countries because of the lack of basic technological capabilities to absorb them. Taking advantage of technological innovation requires capacity to select technologies that help developing countries the most to build their capabilities to meet their needs. Basic ICTs, such as cellular phones and the Internet, are among the most accessible and cost-effective technologies for developing countries that also provide numerous other advantages. They require less initial investment in capital and infrastructure than technologies in more traditional sectors and can facilitate technological advances in other fields, for example, the agricultural, manufacturing and service sectors.

20. The Tunis Agenda for the Information Society of the World Summit on the Information Society[1] underscored the significant contribution that ICTs can make to achieve the goal of universal education, create an enabling environment for lifelong learning and improve professional competencies and technical skills, including knowledge of health and environmental issues, and agricultural know-how. The World Summit on the Information Society also stressed the importance of improving access to ICT for all and of implementing effective training and education, especially in ICT science and technology.

21. ICTs allow low-cost communication across traditional, social and geographical barriers. The Internet has provided a tool that makes possible worldwide dissemination of information and knowledge at virtually no cost. This has an enormous impact on human resources in developing countries.

22. ICTs also offer opportunities for higher quality and more accessible education. Experience with ICTs to date has shown that they can be an extraordinary tool to improve teacher performance and competence, provide chances for continued training, improve teaching and learning methodologies and make education more participatory and better connected to the outside world.

23. E-learning is a cost-effective teaching and training medium for reaching a wider audience with more up-to-date and user-friendly content and better learning results, especially among the poor. It also provides more equitable access to learning and training opportunities for out-of-school children and youths not able to attend school during regular hours and for marginalized groups, such as the urban poor and rural dwellers who live in remote areas. The cost-efficiency and flexibility afforded by various modes of distant education and the ability to re-use well-developed material easily and widely without need for the presence of highly skilled instructors contribute to its increasing popularity as a tool for capacity-building. E-learning is fast becoming a premier means to provide the constant education required to be part of the global workplace.

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[1] See *World Information Society 2007 Report: Beyond WSIS*, Geneva, May 2007

24. ICTs also have the potential to build a critical mass of scientists and engineers to drive national development processes. Low-cost communication afforded by ICTs makes virtual research communities across countries far more feasible. Exchange of information worldwide maximizes learning and provides an opportunity for developing countries to draw on the skills and resources available elsewhere, including their own diaspora. Some developing countries have created centres of world-class research for a range of new technologies. This allows them to set priorities for research and generate regional and international cooperation. ICTs also have enormous potential to promote the convergence of many areas of science, engineering and technology by encouraging information flows across disciplines and cross-sectoral research to create new knowledge.

25. ICTs can be instrumental in promoting technological learning and innovation in the productive sector by increasing information on suitable cost-effective technologies. For example, they can be used to demonstrate enhanced farming practices and other new technologies, as well as to introduce novel ideas such as recycling agricultural by-products and cottage industries. This can increase technological learning and training in these practices and the capacity of the workforce to absorb new technologies, including solving related production problems, carrying out reverse engineering and eventually driving technological change. Greater participation of private business in ICTs could facilitate the transformation of knowledge into endogenous technical capabilities.

26. Connectivity can be instrumental to increasing civic participation and the quality and delivery of social services, including extension for the agricultural and agro-industrial sectors. The Internet can also be a powerful instrument to increase local civic participation and mobilization to increase awareness of important developmental issues, as recent successful campaigns on HIV/AIDS drugs and against corruption have demonstrated. Many countries have already put in place and launched e-government facilities and procedures, and public services are gradually becoming computerized, such as e-learning, which has a mutually reinforcing relationship with e-government, e-health, e-farming and e-business.

27. When strategically deployed and integrated into the design of development interventions, ICTs can stretch development resources farther by facilitating the development of cost-effective and replicable solutions. The realization of all this potential requires appropriate government policies to build ICT capacity for all and to promote the strategic use of these technologies to increase knowledge-sharing.

C. Sustainable use of science and technology for human resources development

28. The effective employment of science and technology for human resources development cannot be isolated from the human resources that support them. Technology depends on flows of knowledge and resources, and on mechanisms through which information on specific innovation is shared, developed, commercialized and diffused. Turning technology into a tool for human resources development requires an innovative public policy and investment to build technological capacity and skills in order to access, use and adapt technological knowledge and innovation to local needs and conditions. A deliberate effort in this regard is essential to adjust to rapid technological changes and manage their risks effectively and sustainably.

29. Evidence shows that successful technological transformation requires a comprehensive innovation policy framework centred on technological learning that integrates science and technology policies with industrial policies geared towards manufacturing and export, and an education and research system that supports entrepreneurship.

30. The role of Government is essential to create an environment suitable for the application of science, technology and innovation. Public intervention in this regard should aim at re-aligning existing policies and institutions with this objective and at setting appropriate standards and incentives to mobilize creativity and resources within society. Deliberate measures to enhance awareness of technology benefits and to increase knowledge and demand for more and better performing technology will be necessary to mobilize the participation of key stakeholders: from education and training institutes, to research and development and innovation centres, regulatory agencies, the private sector and financial institutions.

31. Research and development and education are important instruments to promote technological knowledge and learning and critical policy areas for government intervention. Such intervention should promote technology-oriented research and stimulate entrepreneurship. Government strategies should aim at strengthening the links between academia and the productive sector and at encouraging private sector investment in research and development. This would facilitate the involvement of key stakeholders in setting the research and development agenda and in pooling resources to pursue research in priority areas for developing countries.

32. University and industry can be linked in various ways: for example, universities can conduct research that addresses the needs of business and industry, including the risks of employing new technologies; create their own spin-off firms; and participate in capital formation projects, such as technology parks and business incubator facilities. The Government can also use a range of policy options to stimulate enterprise research and development, which will ease the financial burden of universities and research institutes to fund and equip research laboratories. For example, the Government can provide fiscal incentives to local industries (inter alia, tax breaks and low rate loans) to invest in research and development or to co-finance research and development funded through technology funds. International market pressure to keep up with technological innovation provides an important incentive for private firms to invest in research and development.

33. The growing presence of multinational corporations and foreign firms in developing countries provides an additional opportunity to encourage private investment in local science and technology learning. The higher skill level required by foreign companies creates a strong demand to develop the necessary local capabilities to expand business opportunities with these companies. The Government could also encourage foreign companies to invest in local skills.

34. International and regional research networks are other mechanisms to increase knowledge and pool resources for research and development. These mechanisms are crucial to access and acquire relevant technology, especially the newest technologies, at low risk and are particularly useful when developing countries have no access to venture capital to fund research and development. Such networks can therefore play a key role in developing technological capabilities in firms and institutions in developing countries. These arrangements, usually between developed countries, are beginning to be extended to developing countries as well, especially

in agricultural and industrial biotechnology. They have the potential to stimulate biotechnology industries and to generate beneficial new products in developing countries.

35. Partnering with regional networks and research facilities can also help address common local and regional issues, optimize research, promote cost-sharing and lead to mutual gains. Examples of these types of networks are the European Union and Euro-Mediterranean programmes, where research groups from both sides of the sea collaborate in projects related to agriculture, environment and health. International networks can also provide funding for neglected fields of research relevant to developing countries' needs but long underfunded despite the possibility of technological transformations.

36. Today's technological transformation has increased the premium on technological creativity and technical skills and has changed the demand for different types of skills. This calls for a rethinking of education and training policies. Investing in higher education in science, technology and engineering and other advanced technological fields has become essential to create technological capability.

37. Universities and technical institutes in these fields play a vital role in the process of economic transformation. Investing in these institutions and upgrading the quality of their scientific and engineering training are essential to equip graduates to participate in the new and emerging technologies and innovation. The quality and orientation of education should be improved at all levels of learning to ensure sufficient enrolment in scientific and technological specializations at the tertiary level.

38. Educational curricula should be upgraded to match the needs of industry, especially ICT industries, to be relevant for the productive sector and society at large. The increasing application and rapid development of ICTs in various sectors of the economy, from manufacturing, to banking, health care and education, make enrolment and training in ICT science and technology critical for developing countries.

39. Technical and vocational education in the private sector is essential to increase technological learning and innovation at the level of firms and to facilitate the emergence of a class of entrepreneurs that can increase technological development. Technical and vocational training is also essential to promote a culture of lifelong learning focused on the continuous upgrading of skills to respond to the changing demands of technology. The Government could establish training centres with the involvement of the private sector or encourage industry associations to establish and manage such centres through fiscal incentives. Training programmes for self-employed entrepreneurs, farmers and those in the informal service sector could also be developed. Entrepreneurs could benefit from computer-assisted workshops and refresher courses on commercial skills, including information on import-export requirements and ways to link with businesses abroad. Small-scale food preparation undertakings, mostly dominated by women, could benefit from video demonstrations to improve flavour, expand choice and ensure hygiene. Farmers could benefit from on-the-job-training on the management and use of specific technologies for soil and water conservation and livestock production.

40. Rapid technological change and limited resources and infrastructure make it necessary for developing countries to find new ways to sustain technological learning. Universities and research institutes can enhance their relevance, quality and resources by developing partnerships with a variety of stakeholders at the national and regional levels. Creative partnerships can also be developed on non-profit initiatives and with philanthropic organizations. This might expand investment in technologies in fields most important for developing countries. An example of this type of partnership is the one between the Novartis Institute for Tropical Diseases and the Singapore Economic Development Board, which seeks to make new drugs (initially for tuberculosis and dengue) available for poor people in developing countries at the lowest possible price.

41. An increasing number of developing countries are beginning to successfully link public science and technology-related institutes with the private sector and academia so as to link research and development activities and education to the productive sectors of the economy. This has brought dynamism, relevance as well as financial benefits to the participating entities along with a more rational use of national resources. Occupational competence has also been sharpened and professional morale boosted by working and learning synergies.

III. National and regional experiences and lessons learned

42. The needs and capacities of human resources in developing countries vary considerably, especially among regions of the world. Countries have addressed their needs for technological innovation in different ways and with different degrees of success, depending on their developmental stage and understanding of the benefits of science and technology for human development.

43. The Indian ICT industry has emerged as a significant driver of the country's economy. Building on the vast potential of the ICT industry, India has made its education more and more industry-relevant. Enrolments in higher education increased considerably in the 1990s, from 5.3 million to 7.7 million between 1991-1992 and 1999-2000. ICT industry-academia partnerships and alliances between the formal and non-formal sectors of education have created a large pool of English-speaking and technically skilled workforce, especially in science, engineering, information technology and research and development, who can harness existing technological knowledge to improve productivity and welfare. Information technology global sourcing has become a key driver of India's competitiveness, along with ICT growth. In 2006, India achieved 21.1 per cent growth domestically and 34.6 per cent in exports, surpassing its original targets in ICT trade. Projects across most states of India are promoting the effective use of ICT to bring benefits and to change the lives of Indians. The declining trend of information technology professionals leaving India, especially in cities like Bangalore, and those projected to return, are indications of greater policy consistency between the education, science and technology and productive sectors.

44. In China, one of the objectives of the tenth five-year plan (2001-2005) was to develop science, technology and education. The plan explicitly focused on nationwide education and ICT training, in primary and middle school, and on developing ICT industry and infrastructure. China aimed at establishing 6,000 distance education centres in western China by 2003 and to connect 90 per cent of

primary and secondary schools to the Internet by 2010. Another long-term goal of the plan was to foster the information technology manufacturing, telecommunication and software industries. For years, the Chinese educational system has been geared up to meet the demand for software engineers who can compete in the global marketplace. Several Chinese academicians entered software engineering research in the early 1980s. Software engineers are now graduating from university and entering the marketplace to compete in the outsourcing global market. China has also actively invested in building competitive ICT infrastructure and telecommunication providers, such as China Telecom, China Unicom, China Mobile, China Netcom, JiTong Communications Company and China Railway Telecom. Informatization has become a key priority for the modernization of the country and for transforming its population into a pool of valuable human resources.

45. In Bangladesh, the country's poverty reduction strategy paper, which treats science and technology as a priority area, recognizes the need to integrate science and technology learning in primary, secondary and higher education so as to build technical skills in order to access and use technological innovation. This has resulted in a greater number of women and men with degrees in scientific disciplines, qualified for advanced technological professions. The lack of opportunities in science and technology, however, has also meant that many qualified workers have entered fields not related to science and technology. There are a number of initiatives in the country, such as the National Science and Technology Fellowship, aimed at addressing this problem by providing training to science and technology graduates in various scientific and technological professions. The objective is to create professional opportunities for qualified persons and to develop a cadre of scientists and technologists to meet the shortage of such resources in the country.

46. At the regional level, the Asia-Pacific Economic Cooperation (APEC) Human Resources Development Working Group has developed a number of important initiatives at the regional level to promote science and technology learning and applications such as the APEC Cyber Education Network, the Knowledge Bank of Policy and Practice, the APEC Cyber Academy Project and its study and seminars on best practices and innovations in the teaching and learning of science and mathematics at secondary level. Other initiatives in progress are the APEC Learning Standards for English and Other Languages, the APEC Business Schools Network, the APEC Learning Community for Shared Prosperity, the APEC E-Language Research Consortium, the APEC E-Learning Training Centre, the ICT Model School Network, the Future Education Consortium and the APEC Future Education White Paper.

47. Romania has developed a multi-projects programme under the heading Cre@tive Romania, whose common purpose is to build functional e-Government with an e-health and e-education programme that can build a strong human resources foundation for the Romanian information society. The programme comes with the Knowledge-Based Economy project, which aims at building local community networks interconnected for the purpose of providing access to communication services, and the Telecentres project, which contributes to decreasing the digital divide between rural and urban areas and fostering affordable electronic communications throughout Romania via access points in rural areas. Developing high-speed networks for research and education puts Romania on the innovation map.

48. Brazil has embraced the view of technological innovation as an essential element to ensure human progress, social inclusion and development for developing countries. It has promoted a number of initiatives aimed at reducing the digital divide in the country and promoting social inclusion. The programme "Gouvernement életronique d'accueil du citoyen", in Brazil, has made it possible for more than 5 million people in 2,500 cities to access the Internet, with 22,000 computers connected. The Telecentres, "Casa Brasil", have made it possible, for the most disadvantaged populations in rural areas, to have free access to the Internet, e-mail, banking services and other virtual services. The initiative "PC Connected" allows the purchase of computers with Internet access at discounted prices.

49. Chile has started an important educational reform aimed at the introduction of science and technology in its education and innovation system. New teaching and learning methodologies are being implemented at all levels of education to enhance the quality and equity of public education services with a greater allocation of resources to these efforts. In 1992, Chile launched a pilot ICT initiative, "Enlaces", which interconnects hundreds of schools in an educational network, especially those in remote areas, with the objective of replicating this initiative for a wider range of public schools. In 1995, "Enlaces" became the 'official' nationwide initiative for the introduction of ICT to the Chilean educational system. The project was able to expand the coverage to the national level without sacrificing quality or equity and built an important social network of educators and pupils facilitated by user-friendly technology and decentralized support.

50. African countries have in the past been severely constrained by the lack of infrastructure in harnessing science and technology for their development. In many countries, communication networks were destroyed during years of civil conflict, while continuing political instability has deterred Governments and companies from investing in new systems. Currently, however, a number of initiatives, both at the regional and country levels, have begun to emerge that aim at increasing the use of ICTs to build technical capacities and skills in African countries.

51. At the regional level, the New Partnership for Africa's Development has put in place an e-Schools initiative for 600,000 primary and secondary schools in Africa aimed at imparting ICT skills to students and teachers in order to enhance teaching and facilitating school management through ICT. The e-Schools will also be used to promote health literacy. Moreover, the initiative aims at making use of e-learning techniques and encouraging private sector partnerships. Their long-term plan is to encourage in-country partnerships to aid development in the continent.

52. At the country level, a number of countries have recognized the need for science and technology for national development over the last decade and have begun to take action in this regard. Many initiatives focus on increasing ICT access and skills among the population and to extend its use to enhance the quality of and access to education.

53. In Uganda, the National Innovation Fund supports over 20 small-scale innovations in various fields, including farm mechanization, post-harvest storage, irrigation, food processing and natural health-care products. One of the largest initiatives in the country to encourage the integration of science and technology and ICT in school education is Uganda Connect (UConnect). The initiative promotes the use of ICT to improve the quality of public education, health, agriculture and other sectors. Two hundred and fifty-six schools throughout the country currently benefit

from this initiative, while officials in 22 rural districts are being trained on site in ICTs and the Internet by the UConnect team. These efforts aim at increasing technology literacy and efficiency among teachers, managers and government officials. SchoolNet is another initiative that aims at transforming the Ugandan educational system. It works in partnership with all Ugandan educational institutions to set up their ICT facilities and to develop the technical and pedagogical capacity necessary to use ICT to enhance teaching and learning, including professional training to develop ICT skills and facilitate skill transfer.

54. In addition, the Millennium Science Initiative finances high-quality research, undergraduate science and engineering programmes, academia-private sector partnerships, student internships, science and policy and integration of science in schools and communities. Its objective is to increase and retain a pool of highly trained professionals in science and engineering relevant to the country's development needs. The Women of Uganda Network (WOUGNET), a non-governmental organization established in 2000 by women's organizations in Uganda, focuses on developing the use of ICTs among women as tools to share information and address challenges collectively. WOUGNET has four major programme areas: information sharing and networking; technical support; gender and ICT policy advocacy; and rural access.

55. In Tanzania, the link between science and technology and human resources development is well recognized. The Ministry of Higher Education, Science and Technology embodies the vision that higher and technical education and science and technology are key to developing human resources for economic growth. The Ministry of Education and Vocational Training also focuses on promoting a science and technology culture at all levels of education to ensure that technological knowledge and its application permeate society and enhance productivity. In recent years, Tanzania has made progress in promoting the use of ICTs. In 2003, it adopted a national ICT policy across important sectors, such as education, manufacturing, health and tourism, in response to the poor harmonization of ICT initiatives that had led to different systems and standards, duplications and inefficient use of resources. This policy is intended to strengthen ICT infrastructure and overcome the lack of adequately trained and skilled personnel, which are the main obstacles to the broader use of ICT in the context of the national development agenda. This includes the creation of appropriate institutional arrangements to enhance the capacities of all relevant stakeholders, such as Government, the private sector and civil society.

IV. Role of the United Nations system in promoting the use of science and technology for human resources development

56. International organizations, especially United Nations agencies, can play a critical role in promoting the application of science, technology and innovation for the achievement of development goals. They can provide guidance and coordination, set norms and standards and provide scientific and technical advice, including on the application of relevant institutions and legislation, such as the intellectual property rights regime. They can also facilitate the creation of networks among science and technology institutions for the compilation and dissemination of databases on research and development activities and the identification and formation of centres of excellence as a means of promoting subregional cooperation.

Several United Nations agencies provide this type of assistance in their focus areas, with programmes and activities ranging from technical training to capacity-building and infrastructure support.

57. The United Nations Conference on Trade and Development has developed several programmes and projects to train technically skilled professionals to use ICTs in various fields. "Network of Centres of Excellence" is a capacity-building project that provides long-term training and workshops for scientists and engineers from Africa. "Connect Africa" provides country-specific training for ICT engineers and technicians from African least developed countries, as well as hardware equipment for public social service delivery. "TrainForTrade" is a demand-driven programme for training and capacity-building on international trade, trade-related services, investment and port management. It makes extensive use of ICTs, combining distance and face-to-face training.

58. The Information Telecommunication Union (ITU) works with networks of regional and local experts, such as the Union's e-Learning Centre and specific projects, such as the "Centres of Excellence", the "Internet Training Centres Initiative" and the "Tap on Telecom Network" initiatives, to train participants in various ICT skills for disadvantaged groups. ITU will soon launch a follow-up project focused on small ICT businesses, with the objective of encouraging local ICT entrepreneurship and forming an ICT skilled workforce able to compete in the global market. The ITU e-Learning Centre currently runs 60 online courses a year, with more then 1,000 registered participants. The objective is to build a series of regional hubs to form a global network running a large share of ITU capacity-building activities.

59. The World Bank focuses on: building developing countries' capacity for science and technology training at all levels of education; research and development; private sector capacity to absorb and utilize existing technology; science and technology policy capacity; and ICT capacity. Projects in these areas include: vocational training; technical education and training; higher education; learning centres and networks; labour force development and lifelong learning; new learning techniques; and the Millennium Science Initiatives (MSI) Centres of Excellence. The Global Information and Communication Technologies (GICT) Department supports developing countries in building human capacity to use ICT in education as a pedagogical tool, as well as to build people's technical skills in ICT-related sectors.

60. The International Fund for Agricultural Development (IFAD) has engaged in supporting capacity-building and human resources development through its research and development grants since 1998. IFAD relies on the creation of multi-actor learning settings and the development of collaborative knowledge generation and management capacities, which stimulate innovation through closer interaction between scientific research and farmers' experimentation and innovation dynamics. IFAD-financed programmes include collaborative research and joint farmer-researcher's experimentations to improve innovations (for example Farmer and Biodiversity Fields in the Sahel); to define new professional qualifications for extension officers and researchers; to involve university students and professors, both from the North and South, in field activities in order to support farmer innovations and promote interdisciplinary approaches; and to create a new institutional environment that strengthens the linkages between agricultural

knowledge information systems and various actors at the global, subregional, national and community levels.

61. The technical assistance and capacity-building sector of the World Intellectual Property Organization focuses on building legal and administrative capacities to protect intellectual property rights. An increasing number of developing countries are now requesting the organization's assistance in the next stage of optimizing the economic and cultural value of such rights. The Asia-Pacific Industrial Property Centre (APIC) has provided training courses and held seminars for countries in the Asia-Pacific region to help increase the understanding and capacity of government and private sector personnel regarding intellectual property rights.

62. The International Labour Organization (ILO) is currently focusing on the role of vendors of ICT products in responding to the scarcity of information technology skills. The ICT vendors have developed a global flexible skills development system that facilitates access to ICT skills and credible certificates for workers in many African countries through, inter alia, Internet-based courses, e-learning and compact discs. ILO also promotes social dialogue through a Tripartite Regional Seminar on Skills and Employability in Telecommunication Services in selected countries in Africa to enable participants to share experiences, discuss challenges, review their roles in improving training and work organization, and identify follow-up activities to be developed and carried out within the action programme on "Skills and Employability in Telecommunication Services in 2007".

63. The International Atomic Energy Agency (IAEA) technical assistance in the African region focuses on the provision of technical cooperation resources and technology in the form of training, expert advice and equipment. It contributes to the implementation of larger projects in which nuclear components are applied. With the contribution of other donors, these projects blossom into programmes in high priority development areas. In the area of health, the establishment of a number of cancer therapy facilities in the African region has been a major achievement. Since IAEA has been involved in human health in Africa, more than 30 nuclear facilities have been set up, at least 5 radiotherapy centres have been built and 40 radiation facilities have been upgraded. Current technical cooperation activities have focused on strengthening the engineering and technology capacity of developing countries to use nuclear technologies for water resource management, nuclear medicine, and radiotherapy.

64. The United Nations Institute for Training and Research (UNITAR) provides innovative training and research on knowledge systems to strengthen human resources capacities of developing countries and economies in transition. UNITAR has progressively introduced new ICT-based methodologies, such as e-learning, in a number of its programmes, complementing traditional training. In addition, UNITAR has provided policymakers with skills-building and policy-focused training on key issues related to ICT policy and governance. In all its activities, UNITAR, in cooperation with strategic partners, seeks to address ICT policies and solutions adapted to the specific needs and constraints of developing countries.

65. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has launched an Open Training Platform project focused on capacity-development needs in developing countries in 21 key domains for local and individual development, such as, inter alia, adult literacy, water, agriculture, environment, community development, information and technology,

entrepreneurship, health and sanitation, gender issues and AIDS. The project provides access to over 850 training resources worldwide through a central access point that allows tailored research of existing human development materials. The upcoming UNESCO medium-term strategy will give new emphasis to the use of science and technology for human resources development that will address an existing weakness in many developing countries' human and institutional capacities. The strategy will underline the need to focus on human and institutional capacity-building in core areas of the basic sciences, engineering and technology.

66. The United Nations Human Settlements Programme (UN-Habitat) has focused on strengthening human resources capacities to use appropriate technologies in urban management and governance. UN-Habitat has recently adopted Web-based distance learning as a tool to deliver training courses and facilitate capacity-building. "Virtual roundtables" have enabled, with little cost, a wide range of experts from different regions to contribute. In partnership with the Helsinki University of Technology, UN-Habitat and the United Nations Environment Programme will be conducting training for policymakers, urban planners, researchers and civil society on sustainable urban planning that will combine interactive training, research and field visits focusing on innovative planning methods and technologies in the areas of housing, energy, waste management and transport. The UN-Habitat medium-term plan for 2008-2013 aims at strengthening its links with universities and enhancing the role of education in promoting sustainable urbanization. The aim is to create a new generation of planners and urban development practitioners prepared to cope with the global challenges of sustainable urbanization and to harness science and technology for achieving it. UN-Habitat has also established a global network of institutions and a partnership programme with the private sector (Environmental Systems Research Institute) to provide geographical information systems software and e-learning tools in support of key urban trends and indicators monitoring. The programme provides up to 1,000 municipalities with geographical information systems software, e-learning tools and technical support on a grant basis for up to one year so as to complement local government efforts to improve urban data collection and analysis for urban planning and management.

67. The United Nations Children's Fund (UNICEF) has engaged with diverse partners in the use of ICT for education. In Maldives, a UNICEF project will establish Teaching Resource Centres to raise teachers' professionalism and involvement. They will be equipped with VSAT broadband Internet capability that will become a hub in the national e-learning network. A teacher training website is being designed to facilitate information exchange, curriculum review and adaptation, and sourcing and review of curriculum supplement materials. In Mexico, UNICEF supports the use of ICT as a means of communication between children in different states. UNICEF has developed a novel communication technology platform with an application, mepemepe.com, which functions as an interactive classroom, project space, art gallery, document-creation engine, resource and databank and social network for and about children. Mepemepe.com is specifically designed to work in areas with very limited connectivity, requiring extremely low bandwidth, and across a variety of hardware options, from desk to cellphone, making children and communities interact with each other in new ways. For example, children engaged in a project on HIV/AIDS in Kenya can share their experience and work with children undertaking a similar project in Ghana. UNICEF Uganda is piloting

the application in back-to-school programmes in internally displaced persons camps and in its Girls' Education Movement, which will be a platform to develop statistics and share information among youth groups throughout the country.

68. The Food and Agriculture Organization of the United Nations (FAO) supports numerous initiatives to facilitate access of men, women and children to ICTs in a non-invasive manner in order to reduce the knowledge gap across agricultural sectors and boost national effort to build capacity to use innovative ICTs for development. FAO activities include training courses and e-learning training materials, Web-based or CD-ROM courses and workshops in various areas of agricultural development.

69. The FAO Best Practices website presents case studies, experiences and lessons learned from FAO projects, pilot studies and research, and links to further technical information. The FAO Knowledge Forum website provides a platform for communities of professionals, particularly those in research and science, to exchange their knowledge in various thematic areas of agriculture. The Global Online Research in Agriculture (AGORA), which partners FAO with major scientific publishers, enables students and researchers in developing countries to gain access to scientific journals on food, agriculture, environmental science and related social sciences, either free or at low-cost. FAO has also established the International Information System for the Agricultural Sciences and Technology (AGRIS) for exchange of national scientific and research information from all agricultural sectors. As a follow up to the World Summit on the Information Society, FAO launched the Bridging the Rural Digital Divide programme and the e-Agriculture Community of Expertise to exchange best practices on the innovative use of ICTs in order to support sustainable rural development. The FAO Technical Cooperation Programme provides technical training at countries' request in projects containing ICT-related components, or in the development and use of national agricultural information systems.

V. Conclusions

70. **The capacity to utilize technology depends on the indigenous skills, capabilities and resources available in a country to manage acquisition, absorption and diffusion of technological innovation relevant to its development. An effective and sustainable capability for science, technology and innovation can only be achieved in the context of an integrated strategy to promote technological knowledge and learning. This requires policy and institutional frameworks centred on building indigenous scientific and technological capacity, including research and logistic infrastructure, and entrepreneurship.**

71. **Training and education systems at all levels are fundamental to increase overall awareness of the benefits of science and technology for human welfare and to increase tertiary enrolments in these disciplines. ICTs are especially instrumental in this regard. ICTs can facilitate equitable access to and diffusion of knowledge. Distance learning provides remote access to educational resources and promotes a culture of lifelong learning to adapt skills to rapid technological transformation. The strategic use of ICTs is critical to accelerate technological learning and innovation.**

72. **The promotion of research and development at the local level is crucial to tap into indigenous resources and creativity so as to create new knowledge and innovation relevant to local problems and conditions. Transforming technological knowledge into social, economic and cultural gains requires the mobilization of various sectors of society and other partners at the international and regional levels to enhance research capacity and resources and to create basic infrastructure necessary to build and support an endogenous technological capacity. Partnerships among key actors in the Government, academia and the local productive sector are essential to develop technology-oriented research and bring about long-term technological transformation.**

73. **The implementation of an approach that views science and technology as a system of interconnected capabilities, including governance, education, institutions, advice and collaboration, requires action both at the national and international levels.**

VI. Recommendations

74. **The following recommendations are made at the national and international levels:**

National level

(a) **Formulate comprehensive strategies for science and technology that include investment in infrastructure for electricity, telecommunications and transportation and investment to improve the quality of and access to education at all levels;**

(b) **Increase the participation of all relevant stakeholders, including disadvantaged groups, such as women, youth and populations living in remote areas, in the formulation of policies and strategies for science, technology, innovation and entrepreneurship to ensure their relevance to national development problems;**

(c) **Integrate science and technology learning in all levels of education to increase awareness of the benefits of science and technology for human welfare, enhance scientific literacy and build a strong technological base for development;**

(d) **Expand technical, vocational, craft and utilitarian science education to all sectors of society, especially women and disadvantaged groups, to increase the impact of science and technology on all productive sectors and to promote lifelong learning beyond formal education;**

(e) **Promote the use of ICTs to facilitate more equitable access to training and education on science and technology and the assimilation and diffusion of technological innovation, especially among women and girls and other disadvantaged groups;**

(f) **Revitalize existing research and development agencies and allocate funds in support of scientific and technological development programmes, including financial incentives to encourage local private-sector investment, and**

formulate strategies to encourage multinational corporations to invest in local technological learning and fund local research and development in primary sectors;

(g) Identify areas in which indigenous science and technology capacity could be enhanced through partnership between universities, colleges, non-governmental organizations, government institutions and relevant institutions and facilities at the subregional, regional and international levels;

(h) Establish strong links among all relevant stakeholders in education to ensure that the educational curricula across the full education process meet the scientific and technological needs of developing countries. They should also increase awareness of the risks associated with the use of new technologies, especially health and environmental risks, and how to manage them;

(i) Develop institutional frameworks and human resources to manage the process of industrial and technological transformation and to minimize the risks and adverse impact of technical change on human development;

International level

(j) Bilateral and multilateral donors should help developing countries to identify areas of technology priority and to assist them in developing core competencies in areas of comparative advantage;

(k) Relevant United Nations agencies and other scientific associations and institutions should identify appropriate methods for nurturing and assisting developing countries' education programmes and help developing countries establish viable partnerships with funding institutions, such as multilateral development banks, intergovernmental funds and private funds to run programmes for sustainable capacity-building in science and technology;

(l) Donors could help developing countries spearhead regional technology research policies and programmes by helping them identify areas for subregional, regional and international collaboration; identifying and developing existing indigenous facilities; identifying appropriate facilities and centres of excellence at the subregional, regional and international levels with which to collaborate; and strengthening research and institutional networks among them. They could also encourage the establishment of science and technology funds to finance national and regional research programmes;

(m) United Nations agencies could support developing countries in raising awareness about the value of science and technology among the general public and among those who have influence on educational policies. To this end, they could promote the development of educational materials for an electronic "virtual education" scheme of relevance to developing countries and explore other opportunities in this regard, such as promoting investment in training for the sustainable management of science and technology equipment;

(n) Donors, including United Nations agencies and non-profit organizations, could support developing countries' projects to investigate practices to build their science and technology capability, including through the use of ICTs, in order to help developing countries identify relevant practices for their successful adaptation and application. Assistance could include the

sponsoring of programmes to improve the quality of and access to technological learning, especially for women and disadvantaged groups, and to promote participation in knowledge networks;

(o) **Donors should support developing countries in formulating science and technology strategies that take into account and address the risks involved in the use of technologies, especially new technologies, such as the environmental and health impact, and include them in their research and development process;**

(p) **United Nations system organizations should integrate, in their policies and programmes, explicit support to build science and technology capacities in developing countries, compatible with local needs, culture and practices and ensure coordination and synergies of efforts.**